

CLAMS

1. A method for sterilizing an article in a sterilization gas atmosphere, comprising the steps of:

- (a) providing a sterilization chamber;
- (b) placing the article into the sterilization chamber;
- (c) equalizing the temperature of the article and an atmosphere in the sterilization chamber;
- (d) sealing the sterilization chamber;
- (e) applying a vacuum to the sterilization chamber for adjusting the pressure in the sterilization chamber to a sterilization pressure lowering the boiling point of water in the sterilization chamber to a temperature below the temperature in the sterilization chamber;
- (f) supplying an amount of water to the sterilization chamber for humidifying the atmosphere in the sterilization chamber;
- (g) supplying ozone-containing sterilization gas to the sterilization chamber;
- (h) maintaining the sterilization pressure in the sterilization chamber for a preselected treatment period; and
- (i) releasing the vacuum in the sterilization chamber.

2. The method of claim 1, wherein the step of equalizing includes equalizing the temperature of the article, the atmosphere in the sterilization chamber and any components and materials in contact with the atmosphere.

3. The method of claim 1, when operated at a temperature in the sterilization chamber of 25 to 40°C.

4. The method of claim 3, operated at a temperature of 25 to 35°C.

5. The method of any one of claims 1 to 3, wherein the vacuum pressure is between 0,1 and 10 mbar.

6. The method of claim 5, wherein the vacuum pressure is between 0,5 and 2 mbar.

7. The method of claim 1, wherein the amount of water is selected to achieve a level of humidity in the sterilization chamber of 85 to 100%.

8. The method of claim 7, wherein the amount of water is selected to achieve a level of humidity of at least 95%.

9. The method of claim 1, wherein the steps (c) to (f) are repeated at least once.

10. The method of claim 9, wherein the steps (c) to (f) are repeated a number of times sufficient to ensure complete sterilization of the article.

11. The method of claim 1, further comprising the step of passing all gases evacuated from the sterilization chamber through a means for destroying ozone to prevent emission of ozone to the atmosphere.

12. A sterilization apparatus for the sterilization of an article, comprising
a vacuum sterilization chamber;

means for equalizing the temperature of the article and an atmosphere in the sterilization chamber;

means for supplying ozone-containing sterilization gas to the sterilization chamber;

means for supplying water vapour to the sterilization chamber; and

means for applying a sufficient vacuum to the sterilization chamber to lower the boiling temperature of water below the temperature inside the sterilization chamber.

13. The apparatus of claim 12, further comprising means for maintaining the sterilization pressure in the sterilization chamber for a preselected sterilization period.
14. The apparatus of claim 12, wherein the means for applying include a door for sealing the sterilization chamber, the means for supplying water vapour include a humidifier with a water reservoir, and the apparatus further comprises a means for controlling the temperature of the chamber, the door, the humidifier and the water reservoir.
15. The apparatus of claim 12, wherein the means for applying a sufficient vacuum include means for adjusting the pressure of the vacuum to a sterilization pressure at which any water in the sterilization chamber is in the vapour phase.
16. The apparatus of claim 12, further comprising means for destroying ozone contained in sterilization gas evacuated from the sterilization chamber.

17. The apparatus of claim 12, wherein the means for supplying ozone-containing sterilization gas is at least one ozone generator.

18. The apparatus of claim 12, wherein the means for applying vacuum is a vacuum pump capable of generating a vacuum pressure at least as low as 55.3 mbar.

19. The apparatus of claim 18, wherein the vacuum pump generates a vacuum pressure at least as low as 22.6 mbar.

20. The apparatus of claim 19, wherein the vacuum pump generates a vacuum pressure below 1.0 mbar.

21. The apparatus of claim 12, further comprising a means for monitoring a level of ozone in the sterilization chamber.

22. The apparatus of claim 12, further comprising means for monitoring and adjusting the vacuum pressure in the sterilization chamber.

23. The apparatus of claim 21 or 22, further comprising a means for controlling the operation of the apparatus by controlling the means for supplying water vapour and the means for applying vacuum in response to information on the ozone concentration and the vacuum pressure in the sterilization chamber, respectively provided by the means for monitoring the ozone level and the means for monitoring the vacuum pressure.